# A light to solve any mysteries

## The world's largest synchrotron radiation facility 'SPring-8'

Large SPring-8 facility surrounding Mt. Miharakuri (both located in Koto)

## Physics, biology, history—all possible fields of research

### From the Research Results Commentary Booklet Issue 100

Sancho Square on ring shaped stone pavement, modeled after SPring-8

Koto, a town built in a valley of the mountains in Nishi-Harima is the location of SPring-8, a huge facility that is capable of producing the world's most powerful synchrotron radiation. The booklet, "SPring-8 NEWS," provides information regarding current research projects in a way that is easy to understand even for humanities students like myself as well as for junior and senior high school students. Soon, its hundredth issue will be published. Some of the research results featured in the booklet may even be Nobel Prize-worthy! Research results are also available for free on their website. For students who are out of school due to the COVID-19 lockdown, now it is a good time to click and open the doors to science. (Takanori Dan)

Koto is about one hour's drive from Himeji Station. It straddles Sayo Town-Koto, Kamigori Town-Koto and Tatsuno City-Shingu-cho-Koto and is called Harima Science Garden City. The SPring-8 facility itself is built at the city border. The address of the Japan Synchrotron Radiation Research Institute (JASRI), which is in charge of user support and also publishes the booklet, is 1-1-1, Koto, Sayo-cho, Sayo-gun, Hyogo 679-5198 Japan.

But to begin with, what is 'synchrotron radiation'? Before visiting the research institute to collect data for the article, I did some preliminary research. Apparently, it is "a thin and powerful electromagnetic wave that is generated when an electron is accelerated to a speed almost equal to that of light and the direction of travel is bent by a magnet". But I cannot say that I really understand it. So I asked Naoto Yagi (age 67), a researcher involved in the editing of the booklet, and Ryosuke Tomimatsu (age 45), a member of the Facilities Use Promotion Department, for a brief explanation of the facility's capabilities.

"The number of research fields in the world is endless but SPring-8 can cover almost all of them", says Yagi. Using synchrotron radiation allows for a better understanding of the type, structure and properties of materials which, for example, are used for the development of new drugs. What is more, the field of research is not limited to physics, chemistry, biology and earth sciences.

In a survey targeting readers of the booklet, the request came up to analyze the "Records of the Three Kingdoms" (Translator's note: a number of ancient Chinese texts) and Yagi holds that "in terms of examining the ancient artifacts themselves, this is not impossible". And referring to a possible use of SPring-8 for analyzing and measuring, he says that "this will help to learn about how people lived in those days and deepen our understanding of history".

An article in the recently published booklet No. 98 titled "Learning about life in the Yayoi period from lumps of ancient rice" introduces the results of a study in which rice from archaeological sites was measured.

People are free to read the booklet in District Administration Office and the booklet is also distributed to schools in the Harima area. Tomimatsu designed the very appealing cover of the booklet and also set up a section to introduce graduate students who are doing research at SPring-8.

## 《What articles do researchers recommend》 Nobel Prize-winning discoveries possible!

From the first issue published in 2002 to the latest issue 99, all booklets are available on the SPring-8 website. I asked Naoto Yagi (age 67) and Ryosuke Tomimatsu (age 45) to give their recommendations on the published research results.

▼Aiming for the Nobel Prize?

Yagi believes that "winning the Nobel Prize in chemistry next year is not a mere fancy" considering the research introduced in an article titled "Elucidating the structure of a complex that forms the core of photosynthesis". This article is published in issue 59 of the booklet. This research aims to artificially reproduce photosynthesis in plants and convert solar energy into energy that can be used by humans. It may sound like a dream yet to come true, but he says that "we have taken a big step forward". High hopes for the future.

▼What got the most attention?

Yagi says that it was the research published in an article in issue 61 titled "How particles from asteroid Itokawa tell the story of the universe". He goes on: "The article introduces the results of the analysis of fine particles brought back by the asteroid probe Hayabusa, which overcame some troubles and miraculously returned to Earth. Only synchrotron radiation can analyze fine particles without destroying them".

Naoto Yagi (left) and Ryosuke Tomimatsu talking about the booklets they have published

▼What is the most difficult study?

Yagi points to an article in issue 99 of the booklet titled "Big advances with SPring-8 in the strive for a nuclear clock with less than one second deviation in 13.8 billion years". This clock can precisely measure time by making use of the constant nature of the light and radio waves which change the energy state of the atomic nucleus. When I asked about the clock's practical use in life, Yagi answers with a laugh："There were no immediate practical applications for the great discoveries of Galileo Galilei and Newton immediately but they proved to be indispensable to humanity. That's what science is all about".

▼Miscellaneous knowledge

The SPring-8 facility circles the foot of Mt. Miharakuri (341 meters). It has a circumference of 1,436 meters and it is built without a single pillar in the building. As the Japanese name of the mountain suggests, there are chestnut plantations. Many people used to come here for picnics before SPring-8 was built. On the site, a place called "Sancho Square" indicates that the facility was built on the town borders of Kamigori-cho, former Shingu-cho and former Mikazuki-cho.

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